Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Secondary Use of the 24.25-24.65 GHz band	)	RM No. _____
For Radiolocation Services	)	

PETITION FOR RULEMAKING

Pursuant to Section 1.401 of the Commission's Rules, Echodyne Corp. ("Echodyne") hereby requests that the Federal Communications Commission ("Commission" or "FCC") establish permanent rules for secondary use of the 24.45-24.65 GHz band for radiolocation applications.[1] Grant of this request will serve the public interest by promoting the efficient use of spectrum and by enabling the deployment of radar devices that can be used to enhance the safety and security of the American public.

I. Background

Echodyne is a technology company headquartered in the Seattle, Washington area that is enabling innovative uses of radar technology by developing high performance, and ultra-low cost, size, weight, and power electronically scanning radars. Its Metamaterial Electronically Scanning Array ("MESA") offers disruptive capabilities for existing radar applications and enables new categories of radars for unmanned aerial systems (UAS), autonomous vehicles, and security.

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[1] 47 C.F.R. § 1.401.

Echodyne sells an electronically scanning airborne detect and avoid (DAA) radar called EchoFlight (formerly MESA-DAA). EchoFlight is intended to be installed on small and medium-sized UAS to aid navigation and avoid collisions. This radar operates in the 24.45-24.65 GHz band, which is available for aeronautical radionavigation uses (both land-based and airborne deployments) under Part 87 of the Commission's Rules.[2] The EchoFlight has been certified under the Commission's equipment authorization processes and is now available for sale in the U.S.

While Echodyne originally intended the EchoFlight to operate only as an airborne DAA device, both government (Federal and non-Federal) and commercial companies have expressed tremendous interest in using the device for ground-based activities, including both ground-based DAA as well as ground-based security and surveillance radar applications. To meet this demand, Echodyne has created a ground-based variant of the radar called EchoGuard (formerly MESA-SSR). Depending on how these ground-based activities are structured, use of the EchoGuard radar may not comply with the existing radionavigation allocation for the 24.45-24.65 GHz band.

Under Section 2.106 of the Commission's rules, the 24.45-24.65 GHz band is allocated for primary Federal and non-Federal shared use for radionavigation services and inter-satellite communications.[3] When EchoFlight is used on a UAS or when EchoGuard is used as part of a ground-based air traffic control system, such use meets the definition of "radionavigation" under the ITU definition that has been incorporated into the Commission's rules and, therefore,

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[2] 47 C.F.R. § 87.173 (b).

[3] International footnote 5.533 applies to the band, which states that "[t]he inter-satellite service shall not claim protection from harmful interference from airport surface detection equipment stations of the radionavigation service." *See* 47 C.F.R. § 2.106.

complies with the current allocation.[4] However, if the same radar device is installed on the outer wall of a prison to monitor for intruding drones, that application better meets the definition of "radiolocation" as the detection of objects is not used directly to aid in aircraft navigation.[5] It is important to note, however, that whether used for radionavigation or radiolocation, the radar itself is performing the exact same radiodetermination function from an RF perspective.

Echodyne is filing this Petition for Rulemaking to establish permanent rules for secondary use of the 24.45-24.65 GHz band for radiolocation applications. Adding a radiolocation allocation to the band would address a public safety need and promote the efficient use of spectrum, without causing any interference issues. Conversely, rigid application of the radiodetermination restrictions in this band results in inefficient use of the spectrum and deters companies such as Echodyne from delivering technology solutions that help protect people and property. Echodyne has filed a Request for Limited Waiver[6] to allow for use of its EchoGuard ground-based radar for security purposes, but a more permanent regulatory structure is needed to ensure that use of the band is proceeding in an orderly fashion. Echodyne is therefore filing this Petition for Rulemaking to make the 24.45-24.65 GHz band available to the radiolocation service on a secondary basis.

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[4] 47 C.F.R. § 2.1 (defining radiodetermination as "[t]he determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves" and defining radionavigation as "[r]adiodetermination used for the purposes of navigation, including obstruction warning").

[5] 47 C.F.R. § 2.1 (defining radiolocation as "[r]adiodetermination used for purposes other than those of radionavigation"). By definition, radionavigation and radiolocation are both a sub-set of radiodetermination.

[6] *See* Request for Limited Waiver, Echodyne Corp., WT Docket No. 17-352, submitted October 27, 2018. ("Echodyne Waiver Request").

II. Grant of the Echodyne Petition for Rulemaking Would Serve the Public Interest

Echodyne believes that secondary use of the 24.45-24.65 GHz band for radiolocation would provide great benefits to the public with little risk to other services or spectrum users. Drone detection, Echodyne's primary use for radiolocation stations, is a direct public safety application. Stadium operators are interested in using the technology to protect the public in vulnerable open spaces.[7] Prison officials want to use the technology to help intercept drones delivering contraband material into prison yards. In addition, Federal agencies are interested in using the technology for homeland security measures to protect U.S. borders and other sensitive sites.[8] Counter UAS solutions typically involve several ground-based radars located around the perimeter of a site but could also include radars on an airborne platform that patrols for intruder drones and/or pursues them. For each of these applications, the EchoGuard radar offers a unique combination of high-performance beam-steering technology and low cost, size, weight and power. Denying radiolocation service access to the 24.45-24.65 GHz band would be contrary to the public interest because it would delay – and could prevent – Echodyne and potentially other companies from enabling Federal and non-Federal users to address these important public safety and security needs.

Echodyne believes that allowing radiolocation services would not undermine the primary allocations in the 24.45-24.65 GHz band. Echodyne has researched use of this band to the best of its ability and has not been able to identify any current licensed or authorized systems

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[7] *See* Cathy Lanier's testimony to the Senate Committee on Homeland Security and Governmental Affairs, September 13, 2018: https://www.hsgac.senate.gov/imo/media/doc/Testimony-Lanier-2018-09-13.pdf

[8] *See* Comments of the U.S. Border Patrol, WT Docket No. 17-352, filed December 13, 2017 ("*The U.S. Border Patrol is responsible for securing America's borders and believes that the Echodyne radar can play a role in detecting illicit cross-border activity in the land and air domains.*")

deployed in the band other than Echodyne's EchoFlight radar. Echodyne is using channelization, transmission coding and other transmission characteristics to prevent interference between its own radars, and other future users of the band could adopt similar techniques. The FCC holds tremendous discretion through its equipment authorization program to ensure that transmitters are compatible before they are authorized. Indeed, almost all of the relevant technical standards for transmitters operating in the 24.45-24.65 GHz band call for the FCC to determine the appropriate technical standards on a case-by-case basis.[9] Echodyne does not propose to alter that process.

Also, there is precedent in the Table of Allocations for the radionavigation and radiolocation services sharing a band. For example, the following bands all have allocations for both radionavigation and radiolocation: 1240-1350 MHz, 2700-3100 MHz, 5350-5650 MHz, and 9.0-9.5 GHz. Band-sharing between these two services is desirable because the same radar can often perform both functions.

Deploying EchoGuard for drone detection and security has little potential to interfere with adjacent band operations. The airborne EchoFlight radar has already received FCC equipment authorization. The ground-based EchoGuard radar, which has similar emission characteristics to the EchoFlight, has been submitted for equipment authorization and has shown that its emissions comply with the relevant limitations to protect any adjacent band operations.[10]

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[9] *See e.g.*, § 87.131 of the Commission's Rules specifying that for radionavigation stations, the "[f]requency, emission, and maximum power will be determined by appropriate standards during the certification process."

[10] The EchoFlight and EchoGuard radars have been tested to show compliance with the emission limitations defined in Section 87.139(a). This emissions mask has the same performance as the mask defined at Section 90.210(b), which is applicable to the radiolocation service. The Echodyne radars have also been tested to show compliance with the applicable NTIA emission mask.

AT&T, which has an interest in neighboring spectrum, filed comments in response to the Echodyne Waiver Request and concluded that it "foresees minimal interference concerns in the short-term."[11] To ameliorate any long-term interference concerns, AT&T recommended that fixed, ground-based radiolocation stations in the 24.45-24.65 GHz band be licensed individually or otherwise registered so that location information of the emitter is readily available.[12]

III. Petition for Rulemaking

Allowing for radiolocation use of the 24.45-24.65 GHz band on a secondary basis requires few rule changes. While the Echodyne Waiver Request focused on relief from certain aeronautical radionavigation rules found in Part 87,[13] the primary changes required for a permanent rulemaking are to the radiolocation service rules found in Part 90 to allow fixed and mobile radiolocation stations in the band on a secondary basis.[14] In addition, the rules for radiodetermination services under Part 87 should be modified to allow for aeronautical mobile radiolocation stations on a secondary basis to maximize both user flexibility and efficient use of the spectrum.

A. Part 90

Specifically, Echodyne recommends modifying Section 90.103 of the Commission's Rules to add the 24.45-24.65 GHz band to the list of available frequencies for the radiolocation

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11 Reply Comments of AT&T, WT Docket No. 17-352, January 25, 2018.

12 *Id.* at 2. *See also,* Further Reply Comments of Echodyne, February 7, 2018, at 2.

13 Echodyne Waiver Request at 6. The request also asks for a waiver of the Table of Allocations in Section 2.106 of the Commission's Rules.

14 The Commission may also consider amending the Table of Frequency Allocations in Section 2.106 of its Rules to accommodate the recommended secondary use of the 24.45-24.65 GHz but it is not clear to Echodyne that this administrative provision is necessary.

service. In addition, a new limitation would need to be added into this same section to explain that use of the band is available on a secondary basis only.

With respect to appropriate technical standards for Part 90 operations, the majority of relevant Part 90 standards are sufficiently flexible to accommodate use of this band for radiolocation service and are compatible with those found in Part 87.

- *Operating Power*. Under Section 90.205(r), the output power of the proposed use would be considered and authorized on a case-by-case basis. No change necessary.
- *Emissions Type*. Under Section 90.207(k), any emission type for radiolocation may be authorized upon a satisfactory showing of need. No change necessary.
- *Bandwidth Limitations*. Use of the 24,450-24,650 MHz band would be subject to note 2 of Section 90.209 which specifies, in part, that "stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis."[15] As such, no change to the rule is necessary.
- *Out-of-Band Emissions*. The Emission Mask B defined at Section 90.210(b), which is applicable pursuant to Section 90.210(n), is identical to the mask defined in Section 87.139(a). No change necessary, but we recommend that a note be added to Section 90.210(n) clarifying that Emission Mask B applies to this frequency band.[16]
- *Frequency Stability*. Under Section 90.213, frequency stability is not specified for bands over 2500 MHz. Echodyne recommends that the FCC modify Section 90.213(a) to add a new entry into the table for the 24,450-24,650 MHz band and to specify the limit as 5000 parts per million to be consistent with the standards contained in Section 87.133.

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[15] 47 C.F.R. § 90.209 (b)(5) n.2.

[16] Currently, Section 90.210 (n) states that equipment operating on frequencies shared with the Federal Government must meet the "applicable Federal Government technical standards." 47 C.F.R. § 90.210 (n). In this context, Echodyne believes that this provision is referring to the applicable emissions limits imposed by the NTIA for the particular class of device. Echodyne notes that as part of its equipment certification, the EchoFlight and EchoGuard radars demonstrated compliance with the RSEC Criteria A emissions limits defined at Section 5.5.7.1 of the NTIA's Manual of Regulations and Procedures for Federal Radio Frequency Management (September 2017 Revision of the May 2013 Edition).

Since the applicable technical standards under Part 87 and Part 90 are similar, we recommend that a note be added to 90.103 stating that a radar that has already received authorization under Part 87 does not need to be re-authorized under Part 90.

Thus, Echodyne's recommended changes to Part 90 would read as follows (new text shown as ***bold, italics, and underlined***):

§ 90.103 Radiolocation Service

* * *

(b)

Frequency or band	***Class of station(s)***	***Limitation***
24,450 to 24,650	*Radiolocation land or mobile*	***31***

* * *

(c)(31) This frequency is shared with and is on a secondary basis to Aviation Services (part 87). A transmitter that has received equipment authorization under Part 87 does not require a separate authorization under Part 90.

§ 90.210 Emission Masks

* * *

(n) Other frequency bands. Transmitters designed for operation under this part on frequencies other than listed in this section, ***including transmitters operating in the 24,450-24,650 MHz band****, must meet the emission mask requirements of Emission Mask B. Equipment operating under this part on frequencies allocated to but shared with the Federal Government, must meet the applicable Federal Government technical standards.*

Users would be required to file applications for license under the existing Part 90 requirements. Echodyne believes, however, that users should be given flexibility to deploy multiple fixed stations within a defined geographical area without specifying the precise geographical coordinates of each fixed station. For example, a correctional institution facility may require as many as eight to twelve security radars to effectively view its perimeter but the precise location of each fixed station may require experimentation to maximize coverage. Also,

the environment surrounding the protected facility may change, resulting in a reorientation of the radar network. Similar flexibility is afforded to licensees of fixed stations in the 4940-4990 MHz band, which Echodyne has attempted to mirror in proposing to add new Section 90.103 (e) to read as follows:

§ 90.103 Radiolocation Service

* * *

(e) A secondary 24,450-24,650 MHz band license gives the licensee authority to construct and operate any number of base stations anywhere within the area authorized by the license, except as follows:

(1) A station is required to be individually licensed if:

(i) International agreements require coordination;

(ii) Submission of an environmental assessment is required under §1.1307 of this chapter; or

(iii) The station would affect areas identified in §1.924 of this chapter.

(2) Any antenna structure that requires notification to the Federal Aviation Administration (FAA) must be registered with the Commission prior to construction under §17.4 of this chapter.

(3) Requests for geographic service areas exceeding 2 kilometers radius will be reviewed on a case-by-case basis.

B. Part 87

Echodyne recommends modifying the rules for Part 87 Aviation Services to allow aeronautical mobile radiolocation stations on a secondary basis and to reflect the changes in Part 90. The only changes needed would be to allow secondary radiolocation services under the same rules that currently exist for radionavigation. For example, Section 87.187 of the Commission's Rules specifies the frequencies available for Aircraft Stations. Paragraph (x) of that section would be modified as shown below:

§ 87.187 Frequencies

* * *

(x) The frequency bands 24450-24650 MHz and 32300-33400 MHz are available for airborne radionavigation devices. ***The 24,450-24,650 MHz band is also available for airborne radiolocation devices on a secondary basis****.*

Similarly, Subpart Q of Part 87, which prescribes rules for stations in the radiodetermination services, would be modified as shown below:

§ 87.471 Scope of Service

Stations in the aeronautical radiodetermination service provide radionavigation and radiolocation services.

(a) Transmission by radionavigation land stations must be limited to aeronautical navigation, including obstruction warning. ***In the 24,450-24,650 MHz band only, radiolocation land stations are permitted.***

* * *

And,

§ 87.475 Frequencies.

* * *

(b) Frequencies available for radionavigation land stations.

* * *

(14) *24,250-25,250, 32,300-33,400 MHz: In these bands, land-based radionavigation aids are permitted where they operate with airborne radionavigation devices.* ***In the 24,450-24,650 MHz band, land-based radiolocation devices are permitted on a secondary basis.***

* * * * *

Echodyne has attempted to identify all relevant rule sections that require modification to enable the use of the 24.45-24.65 GHz band for radiolocation services on a secondary basis. During the course of this proceeding, it may become apparent that other rule sections may

require modification to protect the interests of other radio services or to enhance the functionality of the band for radiolocation. Provided that they are consistent with the fundamental purpose of this petition, Echodyne asks that such additional proposed rule modifications, whether they be submitted by Echodyne or other parties, be treated within the scope of this proceeding.

IV. Conclusion

Radar technology has developed to provide cost-effective detection and security applications that were previously unattainable for all but the highest-value military uses. By adding more flexibility into frequency bands that are already are available for these devices, the Commission can unleash a variety of new services that will enhance homeland security and public safety. Echodyne urges the Commission to expeditiously initiate a rulemaking proceeding to allow for radiolocation use of the 24.45-24.65 GHz band on a secondary basis.

Respectfully Submitted,

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October 24, 2018